

Claims:

1. An optical interferometer for measuring the surface profile of a smooth, reflective surface, comprising:

a light source for generating a light beam in a first polarization state;

a first beam splitter for receiving the light beam and for dividing the light beam into original first and second beams of substantially equal intensity;

a half wave plate for receiving the original second beam from the first beam splitter, and converting the second light beam to a different polarization state;

a polarizing cube beam splitter for receiving and transmitting the original first light beam to the reflective surface at a first point, and for receiving and reflecting the original second light beam to the reflective surface at a second point such that the original first and second light beams are received at the reflective surface an offset distance apart, and such that the original first and second light beams are reflected back to the first beam splitter where they are split and then recombined into new first and second light beams; and

a photodiode for receiving the new second light beam, the new second light beam being constructed by the interference of the half intensity of the original first and the half intensity of the original second light beams, and the photodiode generating signals in response to the changing interference fringes caused as a result of the modulation of the optical path length difference between the original first and second beams so that a local height difference on the reflective surface between the first and second surface points may be determined.

2. The optical interferometer of claim 1, wherein:

the light source generates a light beam in its P-polarization state; and

the original second beam is converted by the half wave plate to its S-polarization state.

3. The optical interferometer of claim 2, wherein the light source is a He-Ne type source.

4. The optical interferometer of claim 2, further comprising a first mirror for receiving and reflecting the original first light beam from the first beam splitter, and reflecting it to the polarizing cube beam splitter.
5. The optical interferometer of claim 4, further comprising a second mirror for receiving and reflecting the original second light beam from the first beam splitter, and forwarding it to the half wave plate.
6. The optical interferometer of claim 5, further comprising a first long working distance objective for receiving the reflected original first light beam from the first mirror before it passes through the polarizing cube beam splitter.
7. The optical interferometer of claim 6, further comprising a second long working distance objective for receiving the reflected original second light beam from the second mirror before it is reflected by the polarizing cube beam splitter.
8. The optical interferometer of claim 2, wherein the first objective long working object and the first mirror are built together as a block assembly, the block assembly being connected to a piezoelectric translator.
9. The optical interferometer of claim 1, wherein the target surface defines the surface of a magnetic recording disc.
10. A method for detecting flatness in a reflective surface, comprising the steps of:
 - generating a light beam in the P-polarization state with a light source;
 - splitting the light beam into first and second beams of substantially equal intensity;

directing the first beam from the first beam splitter through a polarizing cube beam splitter, the polarizing cube beam splitter receiving and transmitting the first light beam to the reflective surface at a first point;

directing the second beam from the first beam splitter through a half wave plate, and converting the second light beam to a S-polarization state;

directing the second beam to the polarizing cube beam splitter, the polarizing cube beam splitter receiving and reflecting the second light beam to the reflective surface at a second point such that the first and second light beams are received at the reflective surface an offset distance apart;

reflecting the first and second light beams from the reflective surface back to the first beam splitter;

splitting the first and second light beams in the first beam splitter;

recombining the split light beams into new first and second light beams; and

directing the new second beam to a photodiode, the new second light beam being constructed by the interference of the half intensity of the first beam and the half intensity of the second beam, and the photodiode generating signals in response to the changing interference fringes caused as a result of the modulation of the optical path length difference between the first and second light beams so that a local height difference on the reflective surface between the first and second surface points may be determined.

11. The method for detecting smoothness of claim 10, wherein the light source is a He-Ne type laser.

12. The method for detecting smoothness of claim 10, further comprising a first mirror for receiving and reflecting the first light beam from the first beam splitter, and reflecting it to the polarizing cube beam splitter.

13. The method for detecting smoothness of claim 12, further comprising a second mirror for receiving and reflecting the second half wave plate.

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14. The method for detecting smoothness of claim 13, further comprising a first long working distance objective for receiving the reflected first light beam from the first mirror before it passes through the polarizing cube beam splitter.

15. The method for detecting flatness of claim 14, further comprising a second long working distance objective for receiving the reflected second light beam from the second mirror before it is reflected by the polarizing cube beam splitter.

16. The method for detecting flatness of claim 10, wherein the first objective long working object and the first mirror are built together as a block assembly, the block assembly being connected to a piezoelectric translator.

17. The method for detecting flatness of claim 10, wherein the target surface defines a surface of a magnetic disc.

18. The method for detecting flatness of claim 10, further comprising the step of:
processing the signals generated by the photodiode to analyze irregularities in the target surface.

19. A method for detecting surface flatness of a magnetic disc, comprising the steps of:

providing a dual-beam, common path interferometer on the magnetic recording disc, the interferometer providing a pathway for a first light beam of a first polarization state to the magnetic disc surface, and a pathway for a second light beam having a second polarization state to the magnetic disc surface;

directing the first light beam onto the magnetic disc surface at a first point;

directing the second light beam onto the magnetic recording disc surface at a second point, the horizontal distance between the first point and the second point being defined by a distance "d";

adjusting the distance "d" by adjusting the pathway for the first light beam;

reflecting the first and second light beams to an intensity beam splitter, the first and second light beams intersecting at the intensity beam splitter and forming new first and second light beams;

directing the new second light beam to a photodiode, the new second light beam being constructed by the interference of half intensity of the first beam and half intensity of the second beam, and the photodiode generating signals in response to changing interference fringes caused as a result of the modulation of the optical path length difference between the first and second light beams so that a local height difference on the reflective surface between the first and second surface points may be determined.

20. The method for detecting flatness of claim 19, wherein the dual-beam, common path interferometer comprises:

- a light source for generating a light beam in its P-polarization state;
- the intensity beam splitter for receiving the light beam and for dividing the light beam into the first and second beams, the first and second beams having substantially equal intensity;
- a half wave plate for receiving the second beam from the intensity beam splitter, and converting the second light beam into its S-polarization state;
- a polarizing cube beam splitter for receiving and transmitting the first light beam to the magnetic recording disc surface, and for receiving and reflecting the second light beam to the magnetic recording disc surface such that the first and second light beams are reflected back to the intensity beam splitter where they intersect and then split into new first and second light beams; and
- the photodiode for receiving the new second light beam.

21. The method for detecting smoothness of claim 20, wherein the light source of the interferometer is a He-Ne type laser.

22. The method for detecting flatness of claim 20, wherein the interferometer further comprises:

a first mirror for receiving and reflecting the first light beam from the intensity beam splitter, and reflecting it to the polarizing cube beam splitter; and

a second mirror for receiving and reflecting the second light beam from the intensity beam splitter, and forwarding it to the half wave plate.

23. The method for detecting flatness of claim 22, wherein the interferometer further comprises:

a first long working distance objective for receiving the reflected first light beam from the first mirror before it passes through the polarizing cube beam splitter; and

a second long working distance objective for receiving the reflected second light beam from the second mirror before it is reflected by the polarizing cube beam splitter.

24. The method for detecting flatness of claim 23, wherein the first objective long working object and the first mirror are built together as a block assembly, the block assembly being connected to a piezoelectric translator.